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THE ECHINOID *MELLITA* IN THE PACIFIC COAST CENOZOIC

By J. WYATT DURHAM¹

Species of the "keyhole urchin" *Mellita* are common members of the shallow water faunas of the New World tropics and also occur in warm temperate areas of the western Atlantic. On the Pacific coast they are known to be living from the head of the Gulf of California to Ecuador (Mortensen, 1948, p. 428). H. L. Clark (1948, p. 337, pl. 62, fig. 60) has recorded *Mellita* from as far north as San Juanico Bay (26° 15' N. lat.) on the west coast of Baja California.

In California an incomplete "keyhole urchin" from the middle Miocene was referred with some doubt to the genus *Mellita* by Grant and Hertlein (1938, pp. 102-103). Examination of the specimen upon which the record was based shows that on the oral surface it has the pores for the secondary tube feet adjacent to the food grooves arranged in linear zones, somewhat similar to the "combs" of the Arachnoididae of the Indo-Pacific. This character, also observable on well preserved specimens referable to *Scutaster*, along with the greatly elongate basicoronal interambulacral plates, indicates that this specimen, despite its narrow, radially elongate lunules, is referable to *Scutaster* or some closely allied undescribed genus.

After elimination of the above record, all known occurrences of the genus are in the Pleistocene and Recent (Caso, 1951, p. 74; Cooke, 1959, p. 46; Kanakoff and Emerson, 1959, p. 21). In view of its occurrence only in the tropical and warm temperate areas of the western Atlantic and eastern Pacific, it is evident that *Mellita* must have a fossil record extending back to at least the upper Miocene when the Central American seaways were open (Durham and Allison, 1960, pp. 66-67), permitting migration from the Panamic to the Caribbean area or vice versa. Thus it may be expected to occur as a fossil in the Miocene and Pliocene of the Neotropical region.

H. L. Clark (1940) reviewed the Atlantic members of the genus separating a new species (*M. lata*) and a new variety (*M. quinquesperforata tenuis*) from the morphologically diverse forms that have been referred to *Mellita quinquesperforata* Leske. Mortensen (1948, pp. 422-427) did not feel that this separation was warranted, and Cooke (1959) has ignored *M. lata*. However, the nearly constant and distinct morphological types represented in the collections of the Museum of Paleontology of the University of California from different localities in the Caribbean region strongly suggest that Clark's segregations are well warranted and that probably additional taxa should likewise be recognized. A few large collections from single populations suggest that the amount of variation for a species in this genus is relatively small.

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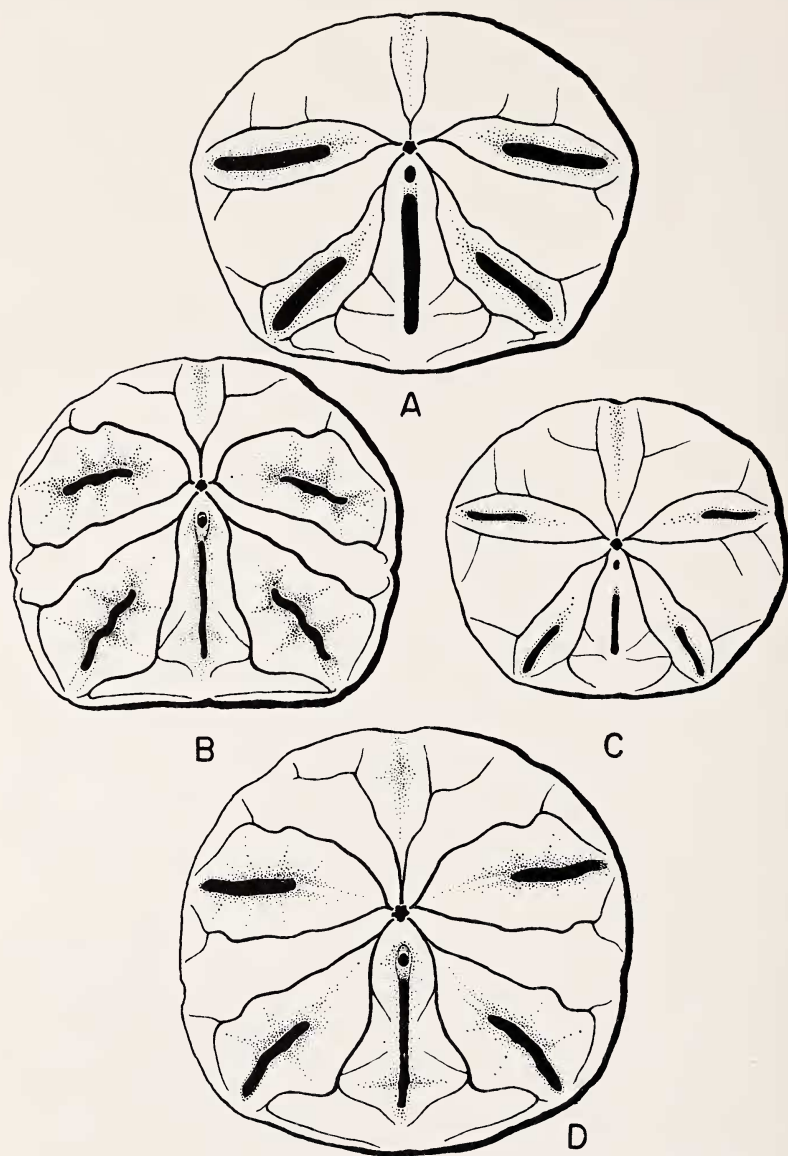


Fig. 1. Oral surfaces of *Mellita* spp. A, *Mellita longifissa* Michelin, approximately $\times 1$ (after Caso, 1946, fig. 10); B, *Mellita notabilis* H. L. Clark, $\times 0.75$, hypotype UCMP no. 34686, UCMP locality A-3986; C, *Mellita grantii* Mortensen, composite figure after hypotypes UCMP nos. 34685 and 34688, UCMP locality A-6600; D, *Mellita kanakoffi* n. sp., $\times 0.75$, holotype LACM no. 1123, LACM locality 66-2.

In the eastern Pacific, *Mellita longifissa* was described by Michelin in 1858 and has been considered to be the most common living species in the Pacific. In 1947, H. L. Clark described a new species, *Mellita notabilis*, based on a specimen that was reported to be from Florida, but noted (1947, p. 78) that it "... probably comes from the western coast of Central America." Comparison of the type with specimens from the west coast of Central America indicate that they represent the same species and confirm Clark's inference as to its origin. In 1948 Mortensen described *M. grantii*, a species that has been recorded only from localities in the head of the Gulf of California as far south as Las Animas Bay. The species first recorded by Kew (1920) as referable to *M. longifissa* from the Pleistocene of Newport Beach, California, is actually distinct from all the above Pacific Coast species. During the last few years Mr. George P. Kanakoff of the Los Angeles County Museum has collected a large suite of specimens of this distinctive Pleistocene species from the Wilmington and Newport Beach areas of California. It is here described as new. The other, living, Pacific Coast species are reviewed. Thanks are due Mr. Kanakoff for the opportunity to study the material collected by him. The illustrations have been prepared with the aid of funds supplied by the Committee on Research of the University of California (Berkeley).

Genus *Mellita* L. Agassiz

Mellita L. Agassiz, 1841, Mon. d'Echin., Sec. Mon., Des Scutelles, p. 34; Mortensen, 1948, Mon. Echin., vol. 4, pt. 2, pp. 420-422; Durham, 1955, Univ. Calif. Pub. Geol. Sci., vol. 31, p. 172.

Type Species: *Echinodiscus quinquesperforatus* Leske

Mellita kanakoffi n. sp.

Pl. 2, fig. 2; Text fig. 1 D

Mellita longifissa Michelin, Kew, 1920, Univ. Calif. Publ. Bull., Dept. Geol., vol. 12, pp. 137-138, pl. 38, figs. 1a-1e. *Non* Michelin, 1858.

Mellita longifissa Michelin n. var. Israelsky, 1923, Univ. Calif. Publ., Bull. Dept. Geol. Sci., vol. 14, p. 382, pl. 70, fig. 2, pl. 71, fig. 2, pl. 72, fig. 1.

?*Mellita longifissa* Michelin, Mortensen, 1948, Mon. Echin., vol. 4, pt. 2, atlas, pl. 58, fig. 5. *Non* Michelin, 1858.

Mellita new sp. Durham, in Kanakoff and Emerson, 1959, Los Angeles Co. Mus., Contrib. in Science, no. 31, p. 21.

Medium to large size (length up to 105.5 mm.); outline of test rounded to pentagonal, never markedly wider than long; margin thin; greatest thickness anterior to apical system; anterior paired lunules as long as posterior pair, about at right angles to anterior-posterior axis of test; posterior paired lunules aligned approximately along continuation of axis of petals; anterior petal longer than anterior paired petals and nearly as long as posterior paired petals; apical system median to slightly anterior; posterior lunule long and narrow; peristome slightly anterior; lunules with slight lateral troughs leading into them on oral surface, the food grooves markedly bifid as typical for genus, the two principal trunks

near margin of each ambulacral area distinct from lunules, markedly sinuous; periproct at anterior end of, and rather deep within, posterior lunule.

DIMENSIONS: Holotype (Los Angeles County Museum no. 1121), length 73.3 mm., width 77.1 mm., height 11.0 mm.; paratype (L.A. Co. Mus. no. 1122), length 105.5 mm., width 107.2 mm., height 16.2 mm.

TYPES: Holotype, Los Angeles County Museum no. 1121; L.A. Co. Mus. loc. no. 66-2; paratype, Los Angeles County Museum no. 1122; L.A. Co. Mus. loc. no. 77; paratype, Univ. Calif. Mus. Paleo. no. 11025 (Kew's specimen); paratype, Univ. Calif. Mus. Paleo. no. 31181 (Israelsky's specimen, formerly numbered 30591); paratype, Calif. Acad. Sci. no. 12368 (CAS. loc. 17946).

TYPE LOCALITY: Upper Pleistocene, Palos Verdes sand, second bed from the top gully in Dry Creek of eastern end of Newport Bay Estuary, $\frac{1}{4}$ mi. south of salt-reducing plant of Irvine Estate (Los Angeles County Museum Invertebrate Paleontology loc. 66-2).

DISTRIBUTION: Pleistocene of Newport Beach, Calif. (Kew, 1920; Israelsky, 1923); Upper Pleistocene, type locality, 7 specimens; Upper Pleistocene, Palos Verdes sand sewer outfall excavation at corner of Lomita Boulevard and Main Street, Wilmington, California (Los Angeles County Museum Invertebrate Paleontology loc. 77), 27 specimens; Recent, Piedra Blanca Bay, Costa Rica (Calif. Acad. Sci. loc. 17946, one specimen).

COMPARISONS: *M. kanakoffi* differs from *M. longifissa* Michelin (see Caso, 1946, figs. 8-10, as well as Michelin's original figures reproduced in Grant and Hertlein, 1938, pl. 21, figs. 1-3) by the anterior lunules being approximately equal in length to posterior paired lunules and not being inclined posteriorly to the axis of the test; by the markedly sinuous instead of gently curved main branches of the food grooves that are distant from, instead of close to, the sides of the paired lunules. *M. grantii* Mortensen has the anterior petal slightly longer than the posterior petals, the main branches of the food grooves only gently curved and close to the sides of the paired lunules, as well as the greatest height of the test coinciding with the apical system. *M. notabilis* H. L. Clark has anterior lunules that are shorter than the posterior paired lunules and posteriorly inclined to the axis of the test. The two specimens recorded by Kew and Israelsky fall within the limits of variation of the collections made by Kanakoff.

The Recent specimen from Piedra Blanca Bay, Costa Rica (Calif. Acad. Sci. loc. 17946), is associated with a specimen of a typical *M. longifissa*. It does not seem to differ from the numerous fossils in any significant manner. The Recent specimen (from Ecuador?) figured by Mortensen (1948, atlas, pl. 58, fig. 5), insofar as can be determined from the aboral surface, is also referable to this species, but the oral surface should be examined.

The Recent occurrences of *M. kanakoffi* in tropical faunas is in accord with the conclusion of Kanakoff and Emerson (1959, pp. 33, 42-43) that

the Newport Bay Pleistocene fauna requires "a warmer hydroclimate . . . than exist[s] in this region at the present time".

***Mellita notabilis* H. L. Clark**

Pl. 1, fig. 2; Pl. 2, fig. 1; Text fig. 1 B

Mellita notabilis H. L. Clark, 1947, Bull. So. Calif. Acad. Sci., vol. 46, pp. 77-78.

Clark's description is inadequate in terms of the criteria used in this paper, so the following description, based on additional specimens, is presented: medium size; outline of test rounded but truncated posteriorly; margins thin; greatest thickness anterior to apical system; anterior paired lunules shorter than, and usually about three-fourths length of posterior paired lunules, inclined posteriorly from axis of test; posterior paired lunules aligned approximately along continuation of axis of petals and slightly arched towards axis of test; anterior petal only slightly longer than anterior paired petals; anterior paired petals about two-thirds length of posterior paired petals; apical system usually about five-twelfths length of test from anterior end; posterior lunule long and narrow; peristome anterior; periproct close to peristome, within anterior end of posterior lunule; paired lunules on oral surface with strongly developed lateral troughs leading into them, giving a sinuous aspect to lunule; food grooves markedly bifid as for genus; two principal trunks near margin of each ambulacral area, distant from lunule and markedly sinuous, with well developed branch parallel to posterior margin in area between posterior paired lunules.

DIMENSIONS: Holotype, length 70 mm., width 78 mm., height 10 mm.

TYPES: Holotype, Los Angeles County Museum no. 1123; hypotypes Univ. Calif. Mus. Paleo. nos. 34686, 34687; hypotype, Calif. Acad. Sci. no. 12367 (C.A.S. loc. 27226).

TYPE LOCALITY: Reported by Clark (1947), with some doubt, as Florida. The other specimens now available seem to indicate, as suggested by Clark, that the type was from the west coast of Central America.

DISTRIBUTION: Recent, type locality, west coast of Central America (?); Recent, Univ. Calif. Mus. Paleo. loc. A3986, Pacific Coast of El Salvador; Recent, Corinto, Nicaragua, Calif. Acad. Sci. loc. 27226 (one specimen), in association with typical *M. longifissa*.

COMPARISONS: See under *M. kanakoffi*. The shorter and posteriorly inclined anterior lunules, the sinuous food grooves distant from lunules, marked lateral grooves to lunules on the oral surface, and prominent posterior marginal branch of food grooves characterize this species.

***Mellita longifissa* Michelin**

Pl. 1, fig. 1; Text fig. 1 A

Mellita longifissa Michelin, 1858, Rev. et Mag. de Zool. Pure et Applique, ser. 2, vol. 10, pp. 360-361, pl. 8, figs. 1a-1c; Grant and Hertlein, 1938, Publ. Univ. Calif. Los Angeles, Math. and Phys. Sci., vol. 2, pp. 101-102 (in part), pl. 21, figs. 1-3; Caso, 1946, An. Inst. Biol. M  x., vol. 17, nos. 1-2, pp.

254-258, figs. 7-10; Mortensen, 1948, Mon. Echn., vol. 4, pt. 2, pp. 427-428 (in part, *non* pl. 58, fig. 5); Clark 1948, Univ. So. Calif. Publ., Allan Hancock Pacific Exped., vol. 8, pp. 337-338, pl. 62, fig. 60. *Non* Kew, 1920, Israelsky, 1923.

Specimens unmistakably identifiable as this species seem to be rare in most collections. Mortensen (1948) and H. L. Clark (1948) each had two specimens. Caso (1946, p. 258) reports 30 specimens from Playa San Benito, Tapachula, Mexico. The California Academy of Sciences has only six specimens from four localities. The inclusion of specimens representing the four Pacific Coast species here recognized under *M. longifissa* probably accounts for Grant and Hertlein's (1938, p. 102) statement: "The species is apparently quite variable."

Using the criteria adopted in this paper, *M. longifissa* is characterized by: apical system slightly anterior, the peristome even more anterior in large specimens; anterior paired lunules about as long as posterior paired lunules, inclined posteriorly; anterior petal slightly longer than anterior paired petals and shorter than posterior petals; lunules on oral surface without marked lateral troughs; primary branches of food grooves not markedly sinuous or angulated and close to margins of lunules; main food grooves in ambulacra Ia and Vb without well-developed branch parallel to posterior margin.

The lack of lateral troughs leading into the lunules on the oral surface, the primary branches of the food grooves close to the lunules and the lack of the secondary branch parallel to the posterior margin of the test seem to be the most diagnostic characters of *M. longifissa*.

HYPOTYPE: Calif. Acad. Sci. no. 12369, from Calif. Acad. Sci. loc. 27230.

TYPE LOCALITY: Unknown, presumably west coast of the Americas.

DISTRIBUTION: As here characterized, this species is known to occur in the Recent fauna at: Piedra Blanca Bay, Costa Rica (Calif. Acad. Sci. loc. 17946, one specimen); Petatlan Bay, Guerrero, Mexico (Calif. Acad. Sci. loc. 27230, two specimens); Mazatlan, Mexico (Calif. Acad. Sci. loc. 27233, one specimen); Corinto, Nicaragua (Calif. Acad. Sci. loc. 27266, three specimens); Playa San Benito, Tapachula, Chiapas, Mexico (Caso, 1946, p. 258, 30 specimens); San Juanico Bay, west coast of Baja California (Clark, 1948, p. 337, two specimens).

Mellita grantii Mortensen

Pl. 1, figs. 3, 4; Text fig. 1 C

Mellita grantii Mortensen, 1948, Mon. Echin., vol. 4, pt. 2, pp. 428-429, pl. 15, fig. 3, pl. 59, figs. 4-5; Mortensen, 1949, Vidensk. Medd. Naturk. Foren, Kobj., vol. 111, p. 72.

Specimens of this species were questionably included under *M. longifissa* by Grant and Hertlein (1938, p. 102) and later were described as new by Mortensen. It is seemingly very distinct from the other west coast species of the genus and may be endemic to the northern part of the

Gulf of California. It may be characterized as follows: Test small to medium size; outline rounded, not posteriorly truncated; apical system central, coinciding with maximum height; paired lunules small, about equal in size, distant from ends of petals and close to ambitus; anterior paired lunules about at right angles to axis of test; posterior unpaired lunule short and narrow, the anterior end terminating close to line connecting distal end of posterior petals; petals small; length of paired petals about one-third radius of test; anterior petal longest, other subequal; paired lunules on oral surface without lateral troughs; periproct about midway between anterior end of posterior lunule and peristome; peristome small, nearly central; food grooves simple, the main branches close to sides of lunules, well inside edges of ambulacral areas; no well developed secondary branch close to, and parallel with margin in ambulacra Ia and Vb.

The immature specimens show the ambulacral lunules starting as indentations on the margin, closing at a length of 24 to 28 mm.

DIMENSIONS: of largest specimen (hypotype, Univ. Calif. Mus. Paleo. no. 34684), length 51.7 mm., width 55.1 mm., thickness 6.8 mm.; next largest specimen (hypotype, Univ. Calif. Mus. Paleo. no. 34685), length 46.3 mm., width 51.7 mm., height 7.3 mm.

TYPE LOCALITY: San Felipe, Baja California.

DISTRIBUTION: Recent, head of Gulf of California, region around San Felipe (Univ. Calif. Mus. Paleo. loc. A-6600, about 100 specimens, from 9 mm. length to maximum recorded; Univ. Calif. loc. A-6904, Ensenada Blanca, 9 specimens); Las Animas Bay, east coast of Baja California (Univ. Calif. Mus. Paleo., loc. A-3639, 2 specimens).

The central apical system, long anterior petal and short lunules readily separate this species from other members of the genus.

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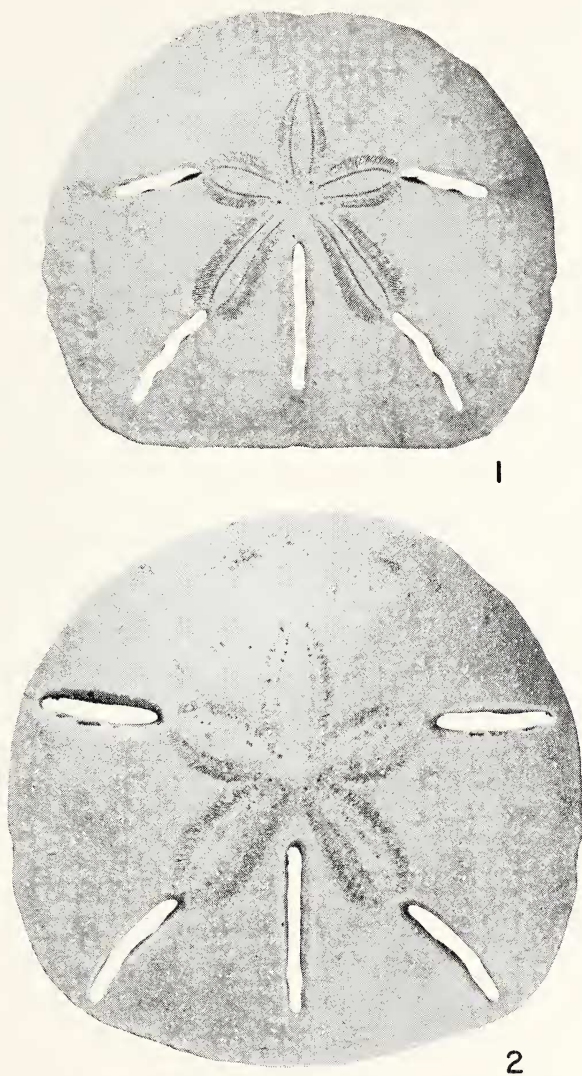


PLATE 1

Fig. 1, *Mellita longifissa* Michelin, $\times 0.5$, hypotype Calif. Acad. Sci. no. 12369, locality 27230. Fig. 2, *Mellita notabilis* H. L. Clark, $\times 0.62$, holotype LACM no. 1123. Fig. 3-4, *Mellita grantii* Mortensen, $\times 1.1$ UCMP locality A-6600, Fig. 3, hypotype UCMP no. 34688; Fig. 4, hypotype UCMP no. 34685.

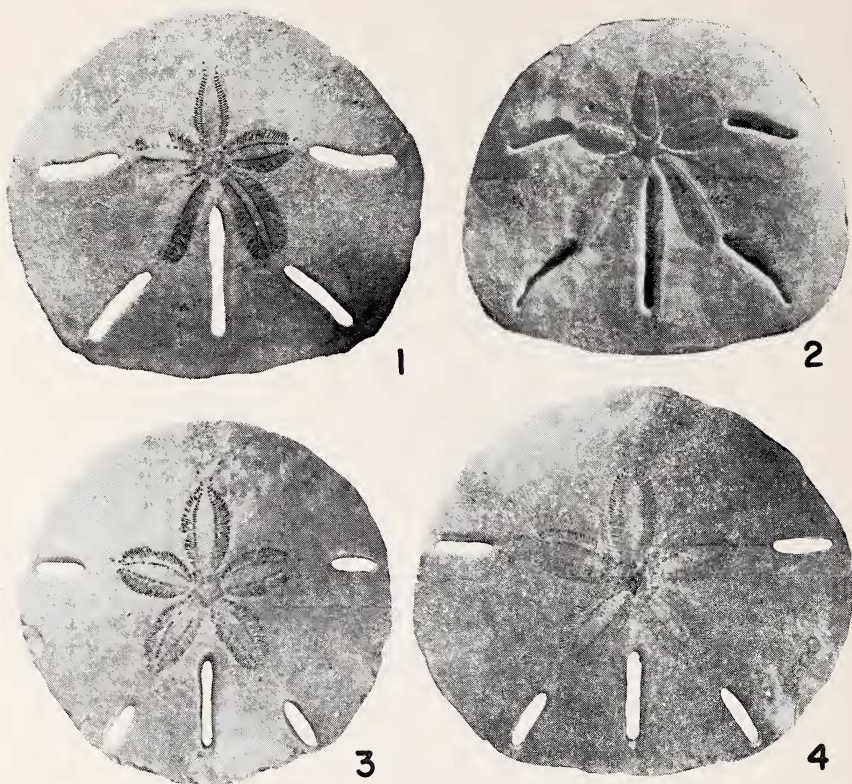


PLATE 2

Fig. 1, *Mellita notabilis* H. L. Clark, $\times 0.5$, hypotype UCMP no. 34686, UCMP locality A-3986. Fig. 2, *Mellita kanakoffi* n. sp., $\times 0.65$, holotype LACM no. 1121, L. A. Co. Mus. locality 66-2.

Erratum:

Figures of Plates 1 and 2 are reversed.